

## PATENT COOPERATION TREATY

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From the  
INTERNATIONAL PRELIMINARY EXAMINING AUTHORITY

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PCT

NOTIFICATION OF TRANSMITTAL OF  
THE INTERNATIONAL PRELIMINARY  
EXAMINATION REPORT

(PCT Rule 71.1)

Applicant's or agent's file reference  
P018298WO MJH

## IMPORTANT NOTIFICATION

International application No. PCT/GB 03/03917	International filing date (day/month/year) 10.09.2003	Priority date (day/month/year) 10.09.2002
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Applicant INGENIA HOLDINGS LIMITED et al.
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1. The applicant is hereby notified that this International Preliminary Examining Authority transmits herewith the international preliminary examination report and its annexes, if any, established on the international application.
2. A copy of the report and its annexes, if any, is being transmitted to the International Bureau for communication to all the elected Offices.
3. Where required by any of the elected Offices, the International Bureau will prepare an English translation of the report (but not of any annexes) and will transmit such translation to those Offices.
4. REMINDER

The applicant must enter the national phase before each elected Office by performing certain acts (filing translations and paying national fees) within 30 months from the priority date (or later in some Offices) (Article 39(1)) (see also the reminder sent by the International Bureau with Form PCT/IB/301).

Where a translation of the international application must be furnished to an elected Office, that translation must contain a translation of any annexes to the international preliminary examination report. It is the applicant's responsibility to prepare and furnish such translation directly to each elected Office concerned.

For further details on the applicable time limits and requirements of the elected Offices, see Volume II of the PCT Applicant's Guide.

The applicant's attention is drawn to Article 33(5), which provides that the criteria of novelty, inventive step and industrial applicability described in Article 33(2) to (4) merely serve the purposes of international preliminary examination and that "any Contracting State may apply additional or different criteria for the purposes of deciding whether, in that State, the claimed inventions is patentable or not" (see also Article 27(5)). Such additional criteria may relate, for example, to exemptions from patentability, requirements for enabling disclosure, clarity and support for the claims.

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**PATENT COOPERATION TREATY**  
**PCT**  
**INTERNATIONAL PRELIMINARY EXAMINATION REPORT**  
(PCT Article 36 and Rule 70)

Applicant's or agent's file reference P018298WO MJH	<b>FOR FURTHER ACTION</b> See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. PCT/GB 03/03917	International filing date (day/month/year) 10.09.2003	Priority date (day/month/year) 10.09.2002
International Patent Classification (IPC) or both national classification and IPC G06K19/06		
Applicant INGENIA HOLDINGS LIMITED et al.		

<p>1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.</p> <p>2. This REPORT consists of a total of 7 sheets, including this cover sheet.</p> <p><input checked="" type="checkbox"/> This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).</p> <p>These annexes consist of a total of 10 sheets.</p>
<p>3. This report contains indications relating to the following items:</p> <ul style="list-style-type: none"> <li>I <input checked="" type="checkbox"/> Basis of the opinion</li> <li>II <input type="checkbox"/> Priority</li> <li>III <input type="checkbox"/> Non-establishment of opinion with regard to novelty, inventive step and industrial applicability</li> <li>IV <input type="checkbox"/> Lack of unity of invention</li> <li>V <input checked="" type="checkbox"/> Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement</li> <li>VI <input type="checkbox"/> Certain documents cited</li> <li>VII <input type="checkbox"/> Certain defects in the international application</li> <li>VIII <input type="checkbox"/> Certain observations on the international application</li> </ul>

Date of submission of the demand 04.03.2004	Date of completion of this report 28.12.2004
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**INTERNATIONAL PRELIMINARY  
EXAMINATION REPORT**

International application No. PCT/GB 03/03917

**I. Basis of the report**

1. With regard to the **elements** of the international application (*Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17)*):

**Description, Pages**

1-49 as originally filed

**Claims, Numbers**

1-75 received on 17.11.2004 with letter of 15.11.2004

**Drawings, Sheets**

1/13-13/13 as originally filed

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
- the language of publication of the international application (under Rule 48.3(b)).
- the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- contained in the international application in written form.
- filed together with the international application in computer readable form.
- furnished subsequently to this Authority in written form.
- furnished subsequently to this Authority in computer readable form.
- The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

- the description, pages:
- the claims, Nos.:
- the drawings, sheets:

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5.  This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)).

*(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)*

6. Additional observations, if necessary:

**V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

**1. Statement**

Novelty (N)	Yes: Claims	7,8,10-14,16-19,21,22,34,35,51,52,66,67
	No: Claims	1-6,9,15,20,23-33,36-50,53-65,68-75
Inventive step (IS)	Yes: Claims	7,8,10-14,16-19,21,22,34,35,51,52,66,67
Industrial applicability (IA)	Yes: Claims	1-75
	No: Claims	

**2. Citations and explanations**

**see separate sheet**

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**Re Item V**

**Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

- 1 Reference is made to the following documents:

D1\*: WO 02 50790  
D2\*: GB 1 601 362

\* These documents were not cited in the International Search Report.

- 2 The present application does not meet the criteria of Article 33(1) PCT, because the subject-matter of claim 1 is not new in the sense of Article 33(2) PCT.

The document D1 discloses (the references in parentheses applying to this document):

A security device comprising two or more magnetic elements (cf. D1, fig. 11, 12, or 14), wherein said magnetic elements are responsive to switch magnetisation state in response to an applied magnetic field to provide a characteristic response (cf. D1, page 24, 2nd paragraph), whereby the elements are made of magnetically soft material (cf D1, pages 31, 32, and fig. 20, disclosing MIOX particles which consists of alpha- $\text{Fe}_2\text{O}_3$ . Alpha- $\text{Fe}_2\text{O}_3$  is a magnetically soft material), hence, discretely switches magnetisation state at an applied field strength that depends upon inherent structural variations that are present in the magnetically soft material (cf. D1, pages 11, 12). No

- 3 Claims 2 - 75 do not contain any features which, in combination with the features of any claim to which they refer, meet the requirements of the PCT in respect of novelty and/or inventive step.

- 3.1 The features added by the following dependent claims are known from D1:

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as to claims 2, 31:

the security device stores a premeasured characteristic response, see D1, page 14, second half;

as to claims 3:

"aggregate response", see D1, page 5, last paragraph - page 6, 1st paragraph (reading of the "image");

as to claims 4 - 6:

see D1, e.g. fig. 14;

as to claim 9:

see cf. D1, page 24, 2nd paragraph;

as to claim 15:

see D1, e.g. fig. 21;

as to claim 20:

see D1, page 42, paragraph f);

as to claims 23, 24:

see D1, e.g. fig. 14;

as to claims 25, 26:

see D1, fig. 19, right upper corner;

as to claims 27 - 30:

see D1, page 42, paragraphs h) - j);

as to claims 32, 33:

the features of said claims do not extend beyond the features of claims 1, 3 - 6 resp. in method terms, hence they are objectionable on the same reasons as claims 1, 3 - 6.

as to claims 36 - 38:

see D1, page 4, last paragraph - page 5, 1st paragraph, page 24, 2nd paragraph; "measurement" via the analysis of the image pattern;

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as to claims 39 - 44:

see D1, page 31, 2nd paragraph;

as to claims 45, 46, 48 - 50, 53 - 59:

see D1, page 24, 2nd paragraph; page 27, 2nd paragraph - page 28, 2nd paragraph; page 42; fig. 9, 17, 19;

as to claim 47:

in D1 the magnetic field is switched on/off for analyzing the images, hence the magnetic field varies in time as claimed;

as to claims 74, 75:

see D1, fig. 18.

- 3.2 The features of following claims do not add any inventive step since they are either straightforward design alternatives which would be within the abilities of a skilled person in the field of forming security devices or can be derived without inventive efforts by combining D1 with document D2.

as to claims 7, 8:

standard dimensions in the field of layered security devices;

as to claims 10, 11:

the claimed materials are some of several straightforward possibilities from which the skilled person would select, see e.g. D2, page 2, line 104 - page 3, line 61;

as to claims 12 - 14:

combining D1, page 44, paragraph t) with D2, fig.2 would directly lead without applying an inventive step to the features of said claims;

as to claims 16 - 19:

their features are already disclosed by D2, fig. 2. It would be obvious to apply these features in the device of D1;

as to claims 21, 22:

design alternatives of the device of D1 which do not justify an inventive step;

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as to claims 34, 35:

these features are standard technology processes from which the skilled person would select to realize a security device;

as to claim 51, 52:

the feature of said claim is one of several straightforward alternatives from which the skilled person would select if a magnetically controlled optical effect has to be used.

3.3 The features of claims 60 - 73 do not extend beyond the features of claims 45 - 59 resp. in method terms.

Hence, the subject-matter of claims 60 - 73 does not fulfill the requirements of Articles 33(2)(3) PCT, resp..

~~Druck exemplar~~CLAIMS

1. A security device comprising two or more magnetic elements, wherein said magnetic elements are responsive to switch magnetisation state in response to an applied magnetic field to provide a characteristic response, characterised in that the elements are made of magnetically soft material that discretely switches magnetisation state at an applied field strength that depends upon inherent structural variations that are present in the magnetically soft material.
- 10 2. The security device of Claim 1, wherein the security device stores a premeasured characteristic response.
- 15 3. The security device of Claim 1 or Claim 2, wherein said characteristic response represents an aggregate response of said magnetic elements to said applied magnetic field.
4. The security device of any preceding Claim, wherein said magnetic elements are supported by a substrate.
- 20 5. The security device of Claim 4, wherein said magnetic elements are supported on said substrate.
- 25 6. The security device of any preceding Claim, wherein the magnetic elements comprise thin layer magnetic material.
7. The security device of Claim 6, wherein the thin layers of magnetic material are less than 1 µm thick.
- 30 8. The security device of Claim 7, wherein the thin layers of magnetic material between 10 nm and 100 nm thick.

9. The security device of any preceding Claim, wherein said magnetic elements are responsive to said applied magnetic field to switch the magnetisation or magnetic polarisation of at least one of the magnetic elements.

5

10. The security device of any preceding claim, wherein at least one of the magnetic elements comprises a magnetically soft material selected from one or more of: nickel, iron, cobalt and alloys thereof with each other or silicon, such as nickel iron alloy, cobalt iron alloy, iron silicon alloy or cobalt silicon alloy.

10

11. The security device of Claim 10, wherein said magnetically soft material is a permalloy material.

15

12. The security device of any preceding Claim, wherein at least one of the magnetic elements is substantially wire-shaped or flattened wire shaped.

13. The security device of any preceding Claim, wherein the device comprises a generally parallel array of elongate rectangular magnetic elements.

20

14. The security device of Claim 13, wherein the magnetic elements comprise an array of generally parallel magnetic nanowires.

15. The security device of any preceding Claim, wherein the magnetic elements have generally the same size and/or shape.

25

16. The security device of any preceding Claim, wherein several discrete groups of differently sized and/or shaped magnetic elements, the magnetic elements being generally similarly sized and/or shaped within each group, are provided so that several different switching fields can be identified.

30

17. The security device of Claim 16, comprising an ensemble of rectangular magnetic elements in parallel array including several discrete groups of magnetic elements of different widths.
- 5 18. The security device of any preceding Claim, wherein differently sized and/or shaped magnetic elements are provided in a continuously varying array, so that variations in sized and/or shape between a magnetic element and its neighbours are minimised to avoid large discontinuities.
- 10 19. The security device of Claim 18, comprising an ensemble of rectangular magnetic elements in parallel array of width varying continuously across the array.
20. The security device of any preceding Claim, further comprising a single relatively large area magnetic element for use as a reference element.
- 15 21. The security device of any preceding Claim, wherein at least one of the magnetic elements is backed by a light reflective layer.
- 20 22. The security device of any preceding Claim, wherein at least one of the magnetic elements is provided proximal a reduced light reflectivity portion of said security device.
23. The security device of any preceding Claim, wherein the magnetic elements are arranged to provide a linear pattern.
- 25 24. The security device of any preceding Claim, wherein said magnetic elements are arranged to provide a two-dimensional pattern.
- 30 25. The security device of any preceding Claim, further comprising a unique identifier incorporated therewith.

26. The security device of claim 25, wherein said unique identifier is provided by way of one or more of; an optically readable bar code; one or more optical indicia; a magnetically encoded identifier; and an electronic identifier.
- 5 27. The security device of claim 26, mounted upon a smart-card, wherein said electronic identifier is provided by a smart-card chip provided on said smart-card.
28. The security device of any preceding Claim, wherein premeasured characteristic response information representing one or more measurable parameters  
10 of said characteristic response is stored on said security device.
29. The security device of Claim 28, wherein said premeasured characteristic response information is in encrypted form.
- 15 30. The security device of Claim 29, wherein said premeasured characteristic response information is encrypted using an asymmetric encryption algorithm with the private key used for enciphering being kept secret and the public key used for deciphering being made available to any reader of the security device.
- 20 31. The security device of Claim 2 or any one of Claims 3 to 30 when dependent on Claim 2, wherein the premeasured characteristic response is stored in machine-readable form.
32. A method of manufacturing a security device, comprising:  
25 providing two or more magnetic elements made of magnetically soft material having random variations introduced into the magnetically soft material during fabrication, wherein said magnetic elements discretely switch magnetisation state in response to an applied magnetic field in order to generate a characteristic response.
- 30 33. The method of Claim 32, comprising providing said magnetic elements on a substrate.

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34. The method of Claim 32 or Claim 33, comprising forming at least one of the magnetic elements using a lift off or wet etching process.
- 5 35. The method of Claim 32 or Claim 33, comprising forming at least one of the magnetic elements using an ion beam etching process.
36. The method of any one of Claims 32 to 35, comprising measuring the magnitude(s) of one or more magnetic parameters of said magnetic elements.
- 10 37. The method of Claim 36, comprising measuring one or more of coercivity and jitter values.
38. The method of Claim 36 or Claim 37, comprising using the measured magnitude(s) of said one or more magnetic parameters to represent premeasured characteristic response information.
- 15 39. The method of Claim 38, comprising encrypting said premeasured characteristic response information.
- 20 40. The method of Claim 38 or Claim 39, comprising storing said premeasured characteristic response information in encrypted or unencrypted form on said security device.
- 25 41. The method of Claim 38 or Claim 39, comprising storing said premeasured characteristic response information in encrypted or unencrypted form in a storage medium remote from said security device.
- 30 42. The method of Claim 41, comprising storing said premeasured characteristic response information in encrypted or unencrypted form in a database.

43. The method of any one of Claims 32 to 42, further comprising providing said security device with a unique identifier.

44. The method of Claim 43 when dependant upon any one of Claims 38 to 42, comprising storing a representation of said unique identifier in association with said premeasured characteristic response information.

45. A system for reading a security device, comprising:

10 security device according to any one of claims 1 to 31 comprising two or more magnetic elements; and

a detection system for measuring one or more discrete magnetisation switching parameters representative of a measured characteristic response of said security device generated in response to said magnetic field,

15 wherein said system is operable to compare said one or more discrete magnetisation switching parameters representative of a measured characteristic response to one or more respective parameters of a premeasured characteristic response to determine whether respective measured and premeasured parameters are substantially equivalent.

20

46. The system of Claim 45, wherein said measured characteristic response and said premeasured characteristic response are representative of an aggregate response produced by said two or more magnetic elements.

25 47. The system of Claim 45 or Claim 46, wherein the magnetic field generation system is operable to apply a time varying magnetic field to a security device.

48. The system of any one of Claims 45 to 47, wherein a light beam is used to interrogate said security device.

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49. The system of Claim 48, wherein said light beam is a visible or near-infrared beam produced by a laser diode.
50. The system of any one of Claims 45 to 49, wherein said parameters represent  
5 one or more of coercivity and jitter values.
51. The system of any one of Claims 48 to 50, wherein said detection system  
incorporates magneto-optic Kerr effect detection apparatus for detecting changes  
induced in said light beam by magnetic elements of said security device.  
10
52. The system of Claim 51, wherein said magneto-optic Kerr effect detection  
apparatus is configured to operate in transverse mode.
53. The system of any one of Claims 45 to 52, further operable to deflect said  
15 light beam across the surface of said security device.
54. The system of any one of Claims 45 to 53, further operable to read a unique  
identifier from said security device.  
20
55. The system of Claim 54, wherein said unique identifier is identified by  
reading one or more of: an optically readable bar code; one or more optical indicia; a  
magnetically encoded identifier; and an electronic identifier.
56. The system of any one of Claims 45 to 55, further operable to determine said  
25 one or more respective parameters of the premeasured characteristic response by  
reading said one or more parameters from said security device.
57. The system of any one of Claims 45 to 56, further operable to determine said  
one or more respective parameters of the premeasured characteristic response by  
30 reading said one or more parameters from a database.

58. The system of Claim 57, wherein said database is remotely located from said detection system.
59. The system of any one of Claims 45 to 58, further operable to decrypt premeasured characteristic response information where it is read or provided in encrypted form.
60. A method for reading the security device according to any one of claims 1 to 31, comprising:
- 10 applying a magnetic field to a security device comprising two or more magnetic elements made of magnetically soft material;
- measuring one or more discrete magnetisation switching parameters representative of a measured characteristic response of said security device generated in response to said magnetic field; and
- 15 comparing said one or more discrete magnetisation switching parameters representative of a measured characteristic response to one or more respective parameter(s) of a premeasured characteristic response to determine whether respective measured and premeasured parameters are substantially equivalent.
- 20 61. The system of Claim 60, wherein said measured characteristic response and said premeasured characteristic response are representative of an aggregate response produced by said two or more magnetic elements.
- 25 62. The method of Claim 60 or Claim 61, comprising applying a time varying magnetic field to a security device.
- 30 63. The method of any one of Claims 60 to 62, wherein measuring of one or more parameters representative of a measured characteristic response of said security device generated in response to said magnetic field comprises measuring one or more of coercivity and jitter values.

64. The method of any one of Claims 60 to 63, comprising interrogating said security device using a light beam.
65. The method of any one of Claims 60 to 64, comprising operating a laser to produce a visible or near-infrared beam.
66. The method of Claim 64 or Claim 65, comprising detecting changes induced in said light beam by magnetic elements of said security device using the magneto-optic Kerr effect.
- 10 67. The method of Claim 66, comprising using the magneto-optic Kerr effect transverse mode.
- 15 68. The method of any one of Claims 60 to 67, comprising reading a unique identifier from said security device.
69. The method of Claim 68, comprising identifying said unique identifier by reading one or more of: an optically readable bar code; one or more optical indicia; a magnetically encoded identifier; and an electronic identifier.
- 20 70. The method of any one of Claims 60 to 69, comprising determining said respective one or more parameters of the premeasured characteristic response by reading said one or more parameters from said security device.
- 25 71. The method of any one of Claims 60 to 70, comprising determining said one or more respective parameters of the premeasured characteristic response by reading said one or more parameters from a database.
- 30 72. The method of Claim 71, comprising accessing a database remotely located from said detection system.

73. The method of any one of Claims 60 to 72, further comprising decrypting premeasured characteristic response information where it is read or provided in encrypted form.
- 5 74. A product comprising the security device of any one of Claims 1 to 31.
75. The product of Claim 74, comprising one or more of a document; a passport; an identity card; a compact disc; a digital versatile disc; a software product; packaging; an item of clothing; an item of footwear; a smart-card; a credit or bank card; a cosmetic item; an engineering part; an accessory; and any other goods and/or items of commerce, whether manufactured or otherwise.
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